



STORK TURBO  
BLADING  
STEAM TURBINE  
BLADES &  
COMPONENTS

# STEAM TURBINE BLADES, VANES AND COMPONENTS

FROM REVERSE ENGINEERING TO FUNCTIONAL PARTS

# CONTENTS

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- OEM Experience & Knowledge
- Supply Chain
- Reference Cases
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# OEM Experience & Knowledge

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- Years of experience with OEM's and their products.
- Continuous tracking of design evolution and history.
- Extensive knowledge base, over 20.000 OEM drawings.
- We've supplied aftermarket parts to both end users and OEM's, and are experienced in the designs and materials of OEM's such as:

- |                      |               |                |
|----------------------|---------------|----------------|
| • Siemens            | • Mitsubishi  | • MAN          |
| • General Electric   | • Parsons     | • Hitachi      |
| • ABB / Alstom       | • Franco Tosi | • Dresser-Rand |
| • Westinghouse       | • Rolls Royce | • Allen        |
| • Woodgroup / Ruston | • Toshiba     | • And more     |

# Supply Chain

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- Our production facilities are assets in any supply chain.
- Capable of quickly producing Turbo Machinery Parts.
- Adaptive and quick to respond Engineering Team.
- Certified approach to Quality.
- Determination to supply as quickly as possible to prevent downtime.
- Multiple production facilities set up to continually manufacture components.
- On site 3D Scanning and data gathering possibilities.

# Reference Cases

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- The next slides will highlight some relevant projects we've executed in the past, in particular large Rotor Blades which pose the most challenges when it comes to manufacturing:
- ABB / Alstom LP-0 Rotor Blades
- General Electric LP Rotor Blades
- Siemens LP Rotor Blades
- Skoda LP Rotor Blades

# ABB / Alstom LP-0 Rotor Blades



OEM:	Alstom (License)
Machine Type:	Steam Turbine
Project Type:	Complete Manufacturing from precision forging including Stellite brazing.
Product:	Rotor Blade LP-0 (L=900mm)
Lead Time:	10 Weeks
Material:	Z12CnDV12-02

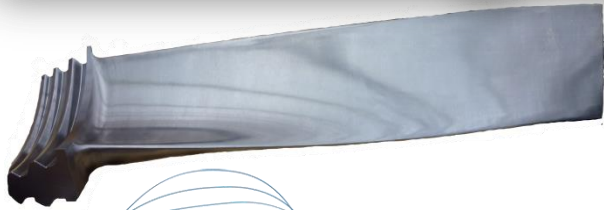
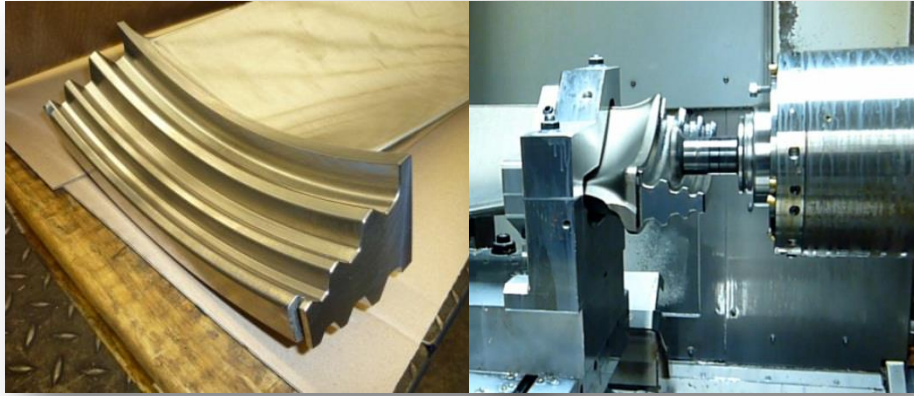
# General Electric LP Rotor Blades

<b>OEM:</b>	<b>General Electric</b>
<b>Machine Type:</b>	Steam Turbine
<b>Project Type:</b>	Manufacturing of finger root, airfoil including midspan.
<b>Product:</b>	LP Rotor Blade RH L=1025mm
<b>Lead Time:</b>	4 Weeks
<b>Material:</b>	Jethete M152 (Envelope Forgings)





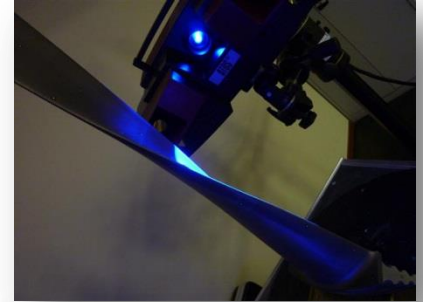
# Siemens LP Rotor Blades



<b>OEM:</b>	Siemens
<b>Machine Type:</b>	Steam Turbine
<b>Project Type:</b>	Reverse Engineering & Manufacturing of LP-0 rotor blades from forging.
<b>Product:</b>	LP Rotor Blades Last Stage GE+TE, including shot peening and laser hardening of airfoil inlet side. Blade Length = 900mm
<b>Lead Time:</b>	12 Months
<b>Material:</b>	X20Cr13 (W-no. 1.4021)

# Skoda LP Rotor Blades

<b>OEM:</b>	Skoda
<b>Machine Type:</b>	Steam Turbine
<b>Project Type:</b>	Reverse Engineering & Manufacturing of multiple stages LP Blades
<b>Product:</b>	LP Rotor Blades Stage 8, 9, 10
<b>Lead Time:</b>	6 Weeks
<b>Material:</b>	Jethete M152 / H46



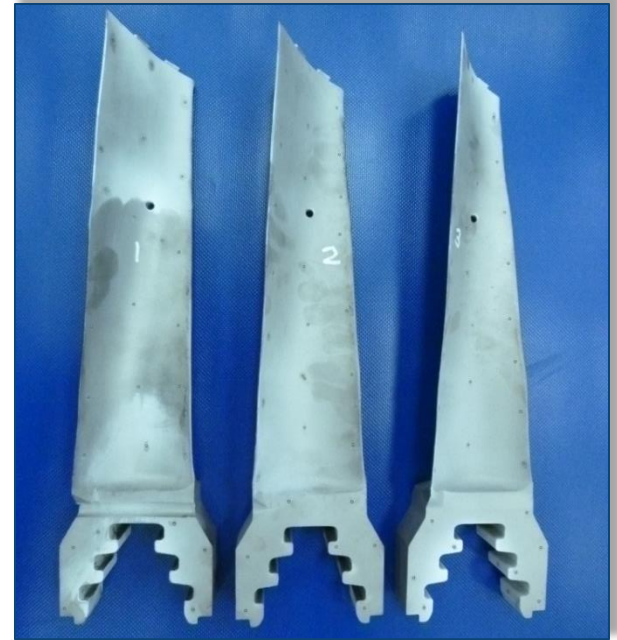
# Reverse Engineering

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- Based on samples Stork can quickly acquire data and generate CAD/CAM models.
- Stork has invested in Sophisticated hard- and software to achieve its goals in realizing high-tech production facilities.
- These processes are in place to ensure the customer gets their desired Turbo Machinery Products with minimal lead times.
- The next slides will highlight our Reverse Engineering Process.

# Reverse Engineering

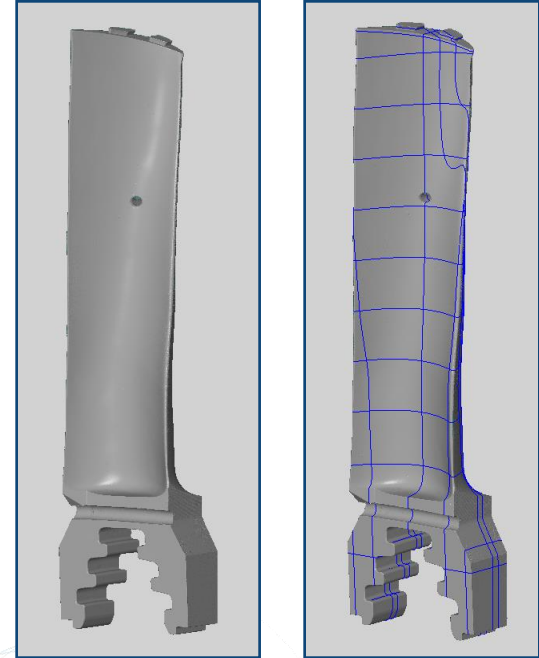
- Single or Multiple samples used for Reverse Engineering.
- Data comes together to reproduce nominal model in digital CAD environment.
- New Model is designed based on available technical information.
- Production method is designed around the model and started as soon as possible.



# Reverse Engineering



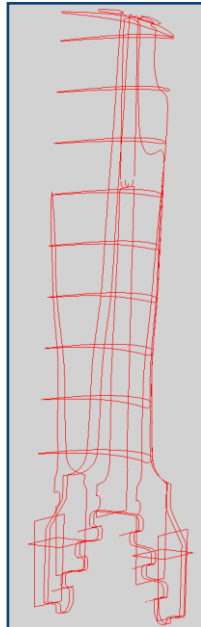
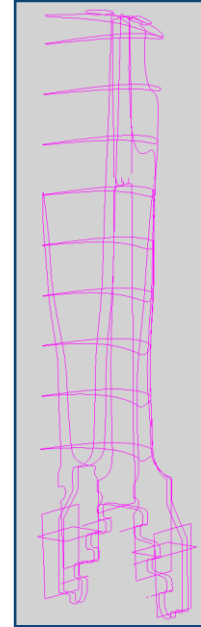
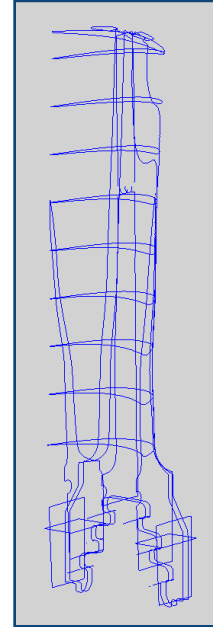
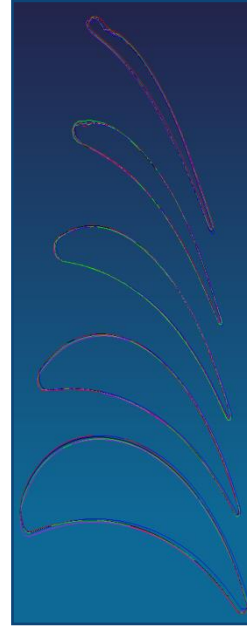
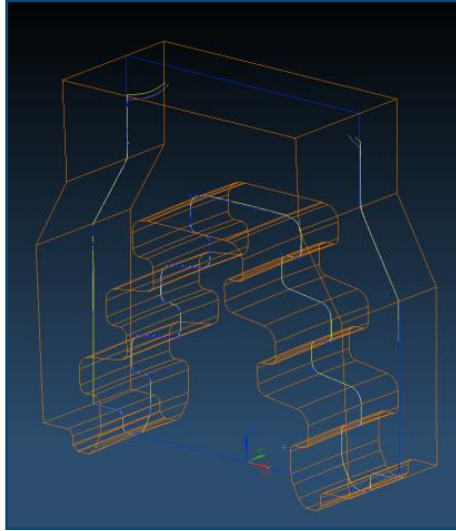
scanning



**ATOS III** optical measuring device used for digitizing samples to 3D pointcloud and meshed model.

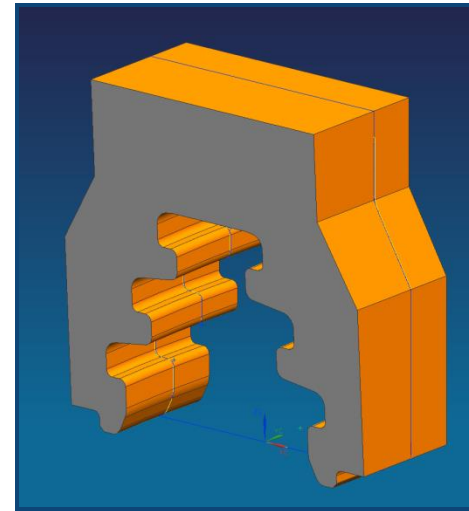
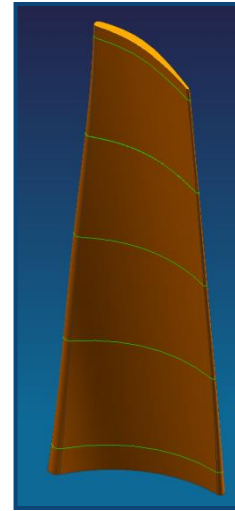
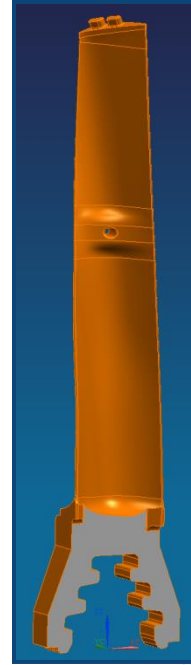
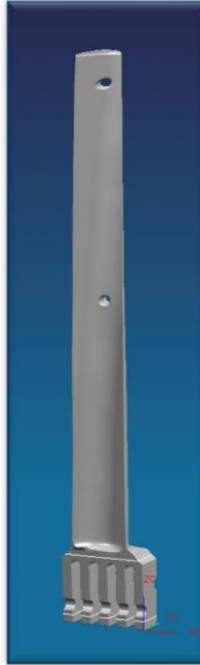
# Reverse Engineering

- Data Analysis.
- Sample Models.
- Comparison.
- Tolerances.
- Production method analysis.
- Redesign.

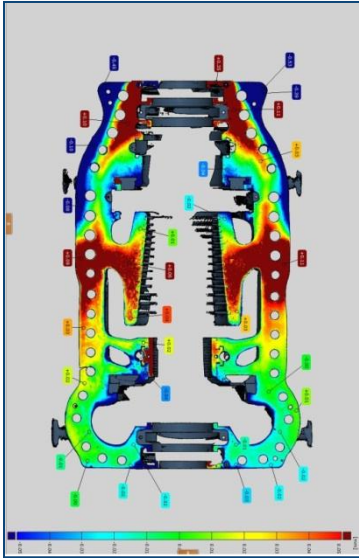
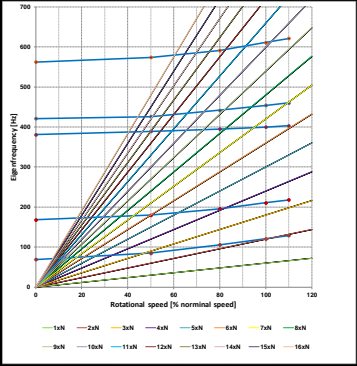
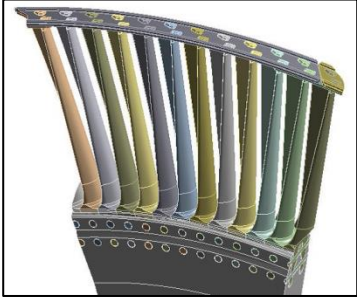
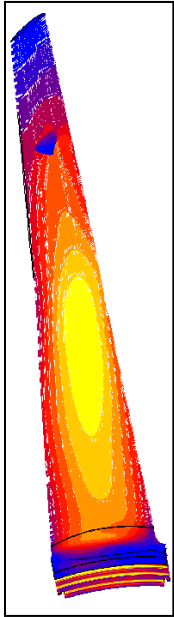
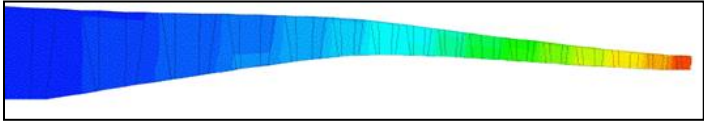
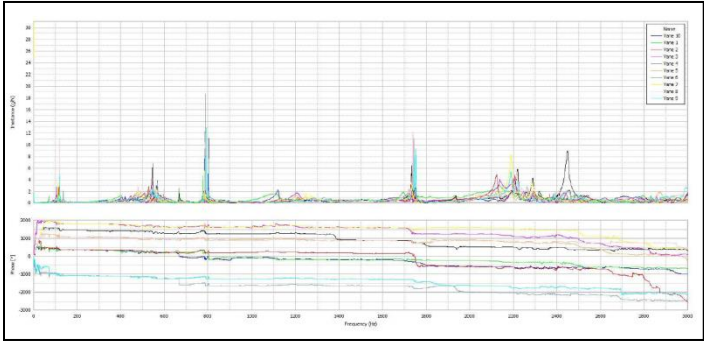


# Reverse Engineering

- Transitional fillets and blends.
- Root and Airfoil Design verification.
- Assembly simulation, FEM Strength Analysis, CFD Flow Dynamics, Frequency and Damping, Moment Weight sequencing, and more.



# Reverse Engineering - Special Studies





# Global Influences

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- Stork Turbo Blading is the preferred global supplier of many companies in the Turbo Machinery Business.
- We have relations and conducted business with companies in all parts of the world, including Europe, Asia, Middle East, USA, Africa, Australia and much more.

# Additional Benefits

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- Longer warranty period than OEM manufacturers.
- Technical Assistance and Knowledge when fitting blades, assembling rotor components, or anything related to Turbo Machinery.
- Extensive database of OEM drawings and knowledge.
- Impressive portfolio related to Turbo Machinery.
- Provision of fit-for-purpose products.
- Short lead time, quick supply.



# THANK YOU STORK TURBO BLADING